Abstract

A sensitive particle distribution probe uses special processing including a modified Twomey/Chahine iterative convergence technique and a specially constructed sample cell to obtain particle size distribution measurements from optically dense slurries, such as the slurries used in the semiconductor industry for chemical mechanical planarization. Spectral transmission data is taken over the spectral range of 0.20 - 2.5 microns, utilizing specially constructed, chemically resistant sample cells of 50 – 2000 microns thickness, and miniature, fixed grating, linear detector array spectrometers. At wavelengths greater than one micron, the preferred design utilizes InGaAs linear detector arrays. An ultrasonic disrupter can be employed to breakup harmless soft agglomerates. In addition to direct particle size distribution measurement, the invention described here could be used to detect other fundamental causes of slurry degradation, such as foaming and jelling. The probe accomplishes continuous, real time sampling of undiluted slurry. A three-position chopper allows automated operation in an industrial environment without the need for frequent reference spectra, which would require taking the probe off-line. In other embodiments, the invention provides a quality control and/or particle size measuring system for CMP slurries using transmission data through an as-used CMP slurry flow. The process of the invention detects transmission through the flow, at select wavelengths, and determines changes in the logarithmic slope of transmission versus wavelength to detect acceptable or unacceptable CMP slurries. The process can further determine CMP slurry particle size through empirical extinction data stored in memory.